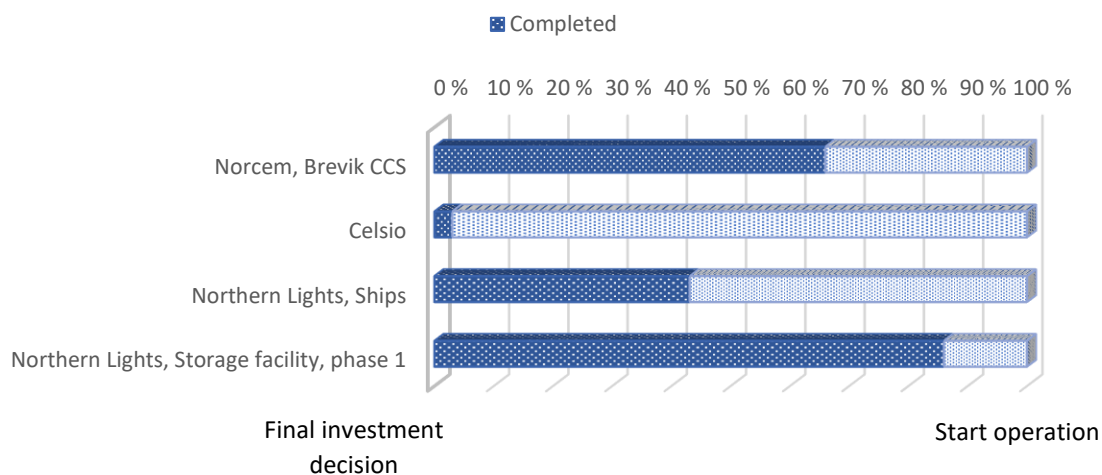


## Status, Longship 30.09.2023

### Highlights

- Construction of the Northern Lights CO<sub>2</sub> transport and storage infrastructure and Heidelberg Materials' capture plant is progressing. Brevik CCS is 66% completed and the Northern Lights storage facility is 86% completed.
- Celsio decided in April to introduce a twelve-month cost reduction phase and place the construction on hold after an updated cost estimate showed that the carbon capture project would exceed the maximum budget stipulated in its government funding agreement.
- Longship will be operational with captured CO<sub>2</sub> from Brevik, transport and storage in 2025, behind the initial plan (late 2024), according to the latest communication from the Government (Prop. 118 S (2022-2023))
- Northern Lights has entered into a transport and storage agreement with Ørsted to store 430,000 tonnes biogenic CO<sub>2</sub> annually from two power plants in Denmark from 2026.
- Overall progress of Longship's construction phase:



## Background – about Longship

- The CCS project Longship, partly funded by the Norwegian government, includes capture, transport and storage of CO<sub>2</sub>.
- A carbon capture facility is currently being built at Heidelberg Materials' cement plant in Brevik, Norway. According to plan, the facility will capture approximately 400,000 tonnes of CO<sub>2</sub> annually.
- Celsio started building a carbon capture facility at their waste-to-energy plant in Oslo in August 2022, but decided to put construction on hold in April 2023 due to a large increase in cost estimates. The project has entered into a cost reducing period of 12 months. According to the initial plan, approximately 400,000 tonnes of CO<sub>2</sub> will be captured annually from Celsio's plant.
- Northern Lights is currently developing a solution for the transport and storage of CO<sub>2</sub>. The CO<sub>2</sub> will be transported by ship from the various emission sources, including the CO<sub>2</sub> from the industrial capture sites of Heidelberg and Celsio, to a receiving facility near Bergen, before being transported by pipeline for permanent storage in a reservoir located 2600 metres below the seabed.
- Several measures are needed to enable European countries to achieve carbon neutrality. Longship will help the hard-to-abate industries reduce their CO<sub>2</sub> emissions and make industrial carbon removals possible through capture of biogenic CO<sub>2</sub> (negative emissions).

### Roles in Longship

- **Ministry of Petroleum and Energy** – Responsible for Norway's CCS policy and Longship on behalf of the Norwegian government
- **Ministry of Foreign Affairs** – Coordinates Norway's foreign service and embassies
- **Gassnova** – State owned company following up Longship on behalf of the Ministry of Petroleum and Energy
- **Northern Lights** – Transport and storage company (Joint Venture owned by Equinor, Shell and TotalEnergies) planning to receive CO<sub>2</sub> from Heidelberg Materials and Hafslund Oslo Celsio, and aiming to provide transport and storage as a service to multiple companies in Europe.
- **Brevik CCS – Heidelberg Materials** – Capture site under construction at the cement plant in Brevik
- **Hafslund Oslo Celsio** – Capture project, now on hold, at the waste-to-energy plant in Oslo

## Status Northern Lights

- Construction of the Northern Lights CO<sub>2</sub> storage facility is **86,3%** completed (2023.08.31).
- The visitor centre was opened in October 2022 by the Norwegian prime minister Støre.
- Preliminary results from drilling operations confirm the storage capacity of at least 5 million tonnes CO<sub>2</sub> per annum. The drilling of one CO<sub>2</sub> injection well and one contingent injection well is completed.
- Dalian Shipbuilding Industry Co., Ltd. (DSIC) is building ships dedicated for CO<sub>2</sub> transport for Northern Lights. September 1, Northern Lights awarded the third ship building contract to DSOC. The overall progress for the first ship, including detailed design, engineering, procurement etc., are now **50,2 %** completed (2023.08.31) and it will be delivered in 2024.
- Northern Lights has entered into transport and storage agreement with Ørsted to store 430,000 tonnes biogenic CO<sub>2</sub> per year from two power plants in Denmark from 2026. Northern Lights is labelling this as an essential step for creating a commercial market for CCS in Europe. In August 2022, Yara and Northern Lights agreed on the main commercial terms on cross border CO<sub>2</sub> transport and storage. From early 2025, up to 800,000 tonnes of CO<sub>2</sub> will, according to plan, be captured from Yara's ammonia and fertiliser plant in Sluiskil in the Netherlands and transported and stored by Northern Lights.
- Northern Lights plan to increase storage capacity to 5 million tonnes per year through an additional development phase (Phase 2) and an increasing customer base. The phase 2 development plan is subject to a final investment decision. FEED studies for phase 2 have been completed.



*Northern Lights' CO<sub>2</sub> receiving terminal in Øygarden.*

## Status Heidelberg Materials

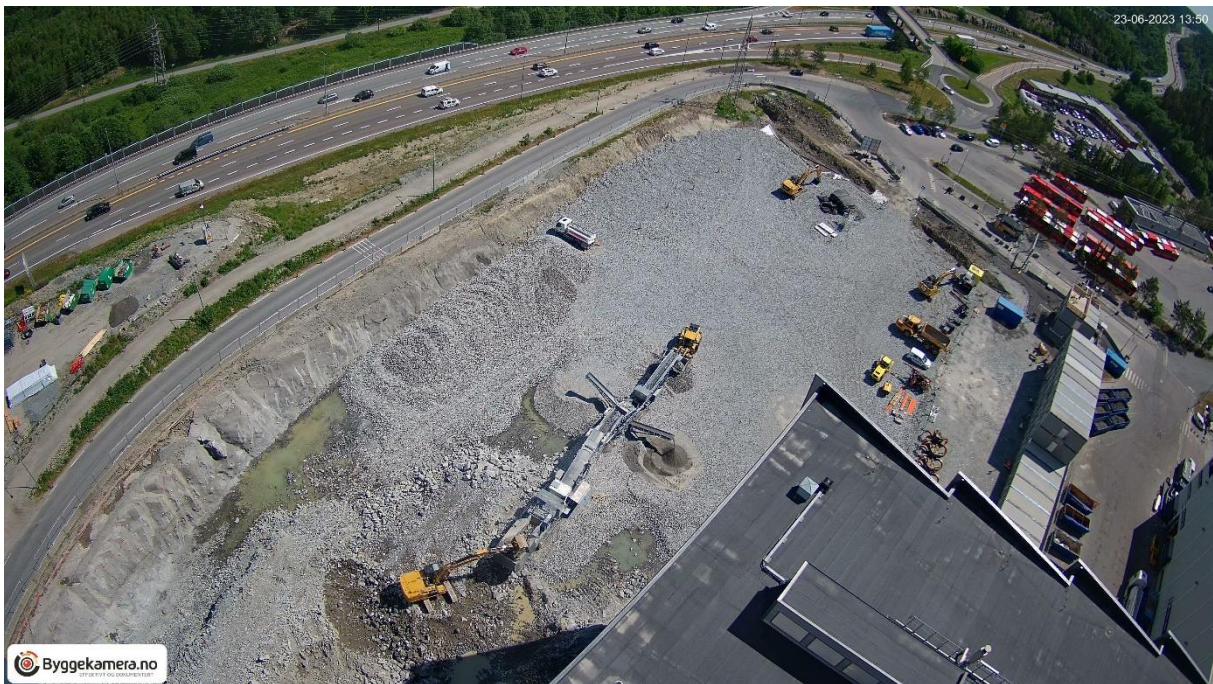
- Overall accumulated actual progress is **66,0%** for the Brevik CCS Project (2023.08.31).
- Generally, Brevik CCS is progressing well, but the project organisation expresses some concern about delays from subcontractors due to the global disturbances in crucial supply chains caused by war in Ukraine and covid-19, leading to major uncertainties in supply of critical materials, equipment, and logistics.
- A very important milestone was reached in August 2023 with the lifting into position of the absorber and absorber stack. This piece of equipment is now the highest point of Brevik Plant and is a very visible testimony that Brevik CCS is progressing.
- The Norwegian state and Heidelberg Materials have signed an agreement securing completion of the capture project after the communicated cost overrun in the project. In the agreement, Heidelberg Materials has undertaken to complete the project and cover increased costs. In return, the company retains a larger share of the potential return on the project. The state undertakes to provide a start-up grant of up to NOK 150 million when the facility is ready to ship the first load of CO<sub>2</sub> to Northern Lights.
- Brevik CCS has experienced vast interest internally and externally. The installation of the absorber has received a lot of attention both externally as well as internally within Heidelberg Materials. Heidelberg Materials now has several emerging projects in other countries, mainly in Europe and North America. Brevik CCS is the frontrunner both within the company and within the industry.



*Heidelberg Materials' plant will be transformed with a new capture plant on site.*

## Status Celsio

- Celsio's carbon capture project started the civil works, blasting and ground works on site in August 2022.
- In April (2023) an updated cost estimate from Hafslund Oslo Celsio showed that the carbon capture project at their waste incineration plant at Klemetsrud would exceed the investment decision and maximum budget stipulated in its government funding agreement. Celsio decided to introduce a twelve-month cost reduction phase and place the construction on hold. During this phase, Celsio aims to identify possible cost reduction areas, then narrow down and prioritize areas to be investigated. They also investigate possible avoided costs and future revenue as important factors before reaching a new final investment decision in the summer of 2024.
- The reasons for the cost overruns are complex, but not related to the CCS technology.
- There is still a clear ambition for Celsio's carbon capture project to become the world's first carbon capture plant on waste incineration in a full value chain with transport and permanent storage of CO<sub>2</sub>. Celsio is owned by Hafslund, Infranode and HitecVision.
- The changes to Celsio's project will not have any impact on the completion of Longship as a whole chain for capture, transportation and storage of CO<sub>2</sub>. The Heidelberg Materials and Northern Lights projects have both passed the halfway point in their construction process and will be able to capture and store CO<sub>2</sub> from 2025.



*Ground works on site at Hafslund Oslo Celsio's waste incineration plant in Oslo. Construction of the CO<sub>2</sub> capture plant is placed on hold.*

## CO<sub>2</sub> storage in Norway

- In total, six exploration licenses to store CO<sub>2</sub> on the Norwegian Continental Shelf have so far been awarded pursuant to the CO<sub>2</sub> Storage Regulation, in addition to Northern Lights' exploitation permit.
  - In August, an exploration license for CO<sub>2</sub> storage east of the Sleipner East field was awarded to Sval Energi AS, Storegga Norge AS and Neptune Energy Norge AS.
  - In March, two exploration licenses for CO<sub>2</sub> storage in the southern part of the North Sea were awarded. Aker BP ASA and OMV (Norge) AS was awarded the eastern CO<sub>2</sub> storage acreage. Wintershall Dea Norge AS and Alterra Infrastructure Group through its subsidiary Stella Maris CCS AS were awarded the northwestern acreage.
  - In October 2022, two companies - Wintershall Dea Norge AS og CapeOmega AS - have been offered exploration license for CO<sub>2</sub> storage in an acreage in the Norwegian part of the North Sea. CapeOmega's part of the license was sold to Total Energies in August 2023.
  - In April 2022, three companies were offered exploration licenses to store CO<sub>2</sub> in two areas on the Norwegian Continental Shelf. The area in the North Sea was offered to Equinor ASA. The area in Barents Sea was offered to a group including Equinor ASA, Horisont Energi AS and Vår Energi AS. Equinor ASA and Vår Energi AS is no longer part of this license.
  - Northern Lights was awarded an exploration permit for the storage part of Longship in 2019.

## CO<sub>2</sub> transport to Norway

- Norway and Germany have agreed to set up a joint Task Force to follow up the results of an ongoing joint feasibility study, which is looking into possibilities to transport hydrogen and CO<sub>2</sub> between Germany and Norway. The feasibility study is undertaken by Gassco and dena (Deutsche Energie-Agentur) on behalf of the industry and includes a large number of industrial partners.

## Resources

- [Spørsmål og svar om Langskip-prosjektet - regjeringen.no](#)
- [Tidslinje for Langskip \(CCS\) - regjeringen.no](#)
- [Full-scale CCS project in Norway - Longship | Reaching the climate goals \(ccsnorway.com\)](#)
- [Northern Lights \(norlights.com\)](#)
- Time-lapse video: [Time-lapse construction of the Northern Lights CO2 transport and storage infrastructure 2021 - YouTube](#)
- [Norcem og karbonfangst | Norcem](#)
- <https://www.celsio.no/karbonfangst-ccs/>

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